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19 May 1970

Material Test Procedure 7-2-085
General Equipment Test Activity

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

HELMETS (AVIATION)

1. OBJECTIVE*

This document provides test methodology and techniques necessary to determine the technical performance and safety characteristics of aviation helmets and associated tools and equipment as described in Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), and Technical Characteristics (TC), and to determine the item's suitability for service tests.

2. BACKGROUND

Requirements exist for Army aviator headgear which is to afford crash, buffet, and bump protection for the wearer.

This headgear, or aviation helmets, are manufactured from materials which can be laminated and bonded to form lightweight but inherently tough and sturdy head enclosing shells. Within and integral to the shell, an energy-absorbent liner is required to provide additional protection. Sizing pads, adjustable straps, and nape assemblies are needed to assure proper fit and balance for the individual airman. Also, helmet design provides for shell edges to be covered by a rubber-like protective beading material.

Required with these helmets are retractable or removable visors or eyeshields for providing protection from glare, windblast, and dust. Visor requirements are especially critical since these essential accessories actually form a large lens, which, if not carefully designed and accurately manufactured, will result in image distortion, transmission of undesirable wavelengths, or diminished image brightness during tactical and operational use.

In addition to the basic protection requirement, the helmet must provide a reliable means for communicating with the airman in the form of built-in and adjustable headphones, microphone, connecting wiring, and cable connectors. These additional helmet mounted devices are required to endure the aircraft environment and hostile effects of high altitudes and to continue to function and provide voice signals of adequate amplitude and fidelity.

3. REQUIRED EQUIPMENT

- a. Measuring Tape, Ruler and Caliper.
- b. Weighing Scale.
- c. Still Camera and Film.
- d. Stop Watch.

*This MTP is intended to be used as a basic guide in preparing actual test plans for the subject equipment. Specific criteria and test procedures must be determined only after careful appraisal of pertinent QMR's, SDR's, TC's and any other applicable documents.

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e. Helmet Shell Test Equipment:

- 1) Impact resistance apparatus, per ANSI Z 90.1-1966 (reference 4J).
- 2) Drop-type impact machine, as specified in Appendix A
- 3) Plumb-bob, 16-ounce, Steel, having a 60-degree point with a radius not greater than 0.015 inches, and a Rockwell hardness of C60.
- 4) Cast, average sized head form, with mountings, as required.
- 5) Wind tunnel or equivalent wind simulating machine, capable of producing wind blast equivalent to 600 mph for a period of 5 seconds, reducing wind speed by 200 mph within 3 seconds, and containing the test item on a head form mounted on a fixed platform.
- 6) Circulating air type oven capable of containing the test item, and producing 160°F circulating air for a period of not less than 6 hours, for heat aging test.
- 7) Precision balance, as required for heat aging test.

f. Helmet Visor Test Equipment:

- 1) Pivotal-sphere hazemeter, or equivalent, per Method 3022 of FED-STD-406.
- 2) Optical distortion tester, per Appendix C, or vertometer (American Optical Co. or Bausch-Loumb Co.).
- 3) Spectrophotometer with monochromator band width of 10 mu or less, and reproduction accuracy of ± 1 percent, over a range from 430 to 730 millimicrons (mu), using illuminant "C", as required for neutrality test.
- 4) Automatic recording spectrophotometer, with monochromator range from 200 to 2500 millimicrons, and paper chart recorder, as required for extended electromagnetic radiation transmittance test.
- 5) Adhesion test tape, pressure sensitive, transparent, at least one inch wide, with a minimum adhesion value of not less than forty ounces per inch of width.
- 6) Optical abrasion tester, with eraser plug, approved by the Frankford, or Rock Island Arsenal.

g. Helmet Communications Test Equipment:

- 1) Aircraft noise simulator, as required.
- 2) Representative aircraft intercommunications set as required for work articulation test.

h. Environmental Test Chambers and Apparatus capable of meeting the specifications of MIL-E-5272 or as indicated below:

- 1) Altitude chamber for explosive decompression test
- 2) Humidity test chamber
- 3) Salt spray chamber

- 4) Fungus resistance testing apparatus
- 5) Sunshine simulation test equipment
- 6) Sand and dust simulating test chamber

i. Facilities and Equipment as required by referenced MTP's and other test documents.

4. REFERENCES

- A. USATECOM Regulation 385-6, Verification of Safety of Materiel During Testing.
- B. USAMC Regulation 385-12, Safety Verification of Army Materiel.
- C. USATECOM Regulation 70-23, Equipment Performance Report.
- D. USATECOM Regulation 700-1, Value Engineering.
- E. USAMC Pamphlet 706-134, Maintainability Guide for Design.
- F. USAGETA Document, Human Factors Evaluation Data for General Equipment (HEDGE)
- G. USAARU Report 67-8, (May 1967), Sound Attenuation Characteristics of Navy SPH-3 (Mod) (LS) Helmet.
- H. ANSI Z 24.22-1957, Measurement of Ear Protectors at Threshold, Method for.
- I. ANSI Z 58.7.1-1951, Method of Spectrophotometric Measurement for Color.
- J. ANSI Z 90.1-1966, Protective Headgear for Vehicular Users, Specification for.
- K. FED-STD-101, Preservation, Packing, and Packaging Materials.
- L. FED-STD-406, Plastics, Method of Testing.
- M. MIL-STD-129, Marking for Shipment and Storage.
- N. MIL-STD-130, Identification Markings of U. S. Military Property.
- O. MIL-A-8806A, Acoustical Noise Level in Aircraft, General Specification for.
- P. MIL-E-5272, Environmental Testing, Aeronautical and Associated Equipment, General Specification for.
- Q. MIL-E-5400, Electronic Equipment, Aircraft, General Specification for.
- R. MIL-L-38169, Lenses, Goggle and Visor, Helmet, Optical Characteristics, General Specification for.
- S. MIL-P-9400, Plastic Laminate Materials and Sandwich Construction, Glass Fiber Base, Low Pressure Aircraft Structural, Process Specification Requirements.
- T. MIL-P-19644, Plastic Foam, Molded Polystyrene, (Expanded Bead Type).
- U. MIL-P-25421, Plastic Materials, Glass Fiber Base - Epoxy Resin, Low Pressure Laminated.
- V. MIL-V-22272, Visors, Protective, Helmet.
- W. OSRD Report 3802 (DDC-ATI 20504), Articulation Testing Methods.
- X. MTP 6-2-110, Handset, Telephone.
- Y. MTP 6-2-115, Headset (Earphones).
- Z. MTP 6-2-500, Physical Characteristics.
- AA. MTP 10-2-500, Physical Characteristics.

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- AB. MTP 10-2-501, Operator Training and Familiarization.
- AC. MTP 10-2-503, Surface Transportability (General Supplies and Equipment).
- AD. MTP 10-2-505, Human Factors Evaluation.
- AE. MTP 10-2-507, Maintenance Evaluation.
- AF. MTP 10-2-508, Safety.
- AG. MTP 10-2-511, Quality Assurance.
- AH. MTP 10-2-512, Reliability.

5. SCOPE

5.1 SUMMARY

This procedure describes the preparation for, and methods of, evaluating the technical characteristics of aviation helmets and their suitability for service testing. The required tests are summarized as follows:

- a. Preparation for Test - A determination of the condition and physical characteristics of the test item upon arrival. Also, to ensure that the test item is complete and functionally operational, and to provide operator training and familiarization procedures.
- b. Helmet Shell Performance Tests - A series of tests to determine the degree of protection offered by the test item under simulated crash and/or high impact situations.
- c. Visor Performance Tests - A series of tests to determine the optical characteristics of helmet visors used by Army flight personnel to protect their eyes from windblast, sunlight, and electromagnetic radiations.
- d. Helmet Communications and Sound Attenuation - A series of tests to determine the electrical characteristics and acoustic capabilities of the test item microphone, and headset, when constrained to the envelope of the helmet shell and when subjected to aircraft noise and high altitudes.
- e. Environmental Effects Tests - A series to determine test item ability to withstand extreme factors imposed by accelerated climatic and environmental conditions and continue to function as intended.
- f. Transportability - An evaluation to determine the ability of the test item to withstand the forces which it will experience during normal handling and transportation.
- g. Maintenance - An evaluation to determine and appraise the test item's maintenance characteristics and requirements, a verification and appraisal of its malfunctions, an evaluation of the test item's associated publications and other common and special support elements (maintenance test package) an appraisal of the test item's design for maintainability (AMCP 706-134: accessibility, ease of maintenance, standardization, and interchangeability), an evaluation of component and system durability and reliability, and the calculation of indicators which express the effects of appropriate preceding aspects.
- h. Safety - An evaluation to determine the safety characteristics and possible hazards of the test item.
- i. Human Factors Evaluation - An evaluation to determine the adequacy of the design and performance characteristics of the test item and associated equipment in terms of conformance to accepted human factors engineering design

criteria.

j. Value Analysis - An evaluation directed at analyzing the primary function and features of the test item for the purpose of reducing the cost of the test item without compromising performance and safety characteristics.

k. Quality Assurance - A review to determine and evaluate defects in material and workmanship.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TEST

6.1.1 Initial Inspection

Upon receipt of the test item at the test site, perform applicable procedures of MTP 10-2-500 and the following:

a. Visually inspect the packaged test item. Record the following:

- 1) Evidence of damage incurred during transport or storage.
- 2) Exterior identification markings not in accordance with MIL-STD-129 or other governing documents.

b. Unpack and remove all traces of protective transport/storage materials. When this has been accomplished, visually inspect the test item. Record evidence of the following:

- 1) Interior marking(s) of shipment not in accordance with MIL-STD-129 or other governing documents.
- 2) Evidence of defects in test item materials and construction treatment and finish, and/or workmanship. Particular attention should be given to test item finish, front edge pad and shell bonding, buckles, fastener snaps, and grommets. Inspect cords and connectors for cuts, kinks, breaks, fraying and loose mounting.

6.1.2 Inventory Check

a. Conduct an inventory against the Basic Issue Items List (BIIL). Record evidence of the following:

- 1) Missing maintenance literature or draft technical manuals
- 2) Shortages in repair parts, accessories, or tools
- 3) Missing kits

b. Submit an Equipment Performance Report (EPR) for each noted shortage or discrepancy.

6.1.3 Inspection and Preliminary Operation

a. Perform preliminary operations/inspections and/or adjustments in accordance with the draft technical manual.

b. Ensure that the test item is thoroughly clean and free of oil, grease, and perspiration. Wipe the visor/eyeshield with a clean damp cloth to remove dust and dirt. Inspect visor release button assembly to ensure that the holding screw is tight and the release mechanism operates smoothly along the tracks. Check communications equipment as follows:

- 1) Determine that the microphone and headset have passed the applicable sections of the appropriate commodity tests (MTP 6-2-110, and MTP 6-2-115 respectively).
- 2) Microphone: Check the membranes of the moisture barrier for cracks in the supporting case, and for excessive sag and breaks. Check microphone boom for loose or missing parts and secure mounting.
- 3) Headset (electrical): Clean earphone cushions with a soft cloth dampened in mild soapy water. Do not permit water to enter the receivers.

c. Examine test item nomenclature, warning, and instructional data plates for conformance to MIL-STD-130 and other governing documents. Record evidence of errors and/or missing plates.

d. Disassemble a test item of the proper type and examine major components according to the checklist below:

- 1) Visor: The critical and semi-critical area of the visor should be free from visually detectable striae, waviness, cloudiness, and imperfections such as pits, lint, bubbles, scratches, and foreign particle imperfections which are gross in both size and quantity. Where requirements do not exist to the contrary, the visor should be in conformance with the criteria of MIL-L-38169 and/or MIL-V-22272 of applicable issue.
- 2) Helmet shell: Unless requirements exist to the contrary, the helmet shell should be in general conformance with MIL-P-9400 and/or MIL-P-25421; the helmet liner with MIL-P-19644.
- 3) Communications Equipment: Test item microphone, headset, cordage, and connectors should be in general agreement with the provisions of MIL-E-5400.

6.1.4 Physical Characteristics

Perform applicable procedures of MTP 10-2-500, and MTP 6-2-500 and determine and record the following, by measurement where appropriate:

a. Visor:

- 1) Type

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NOTE: Indicate the class, per MIL-V-22272 as applicable:

Class 1: Clear visor lens
Class 2: Neutral gray visor lens
Class 3: Gold coated visor (99% filter) lens

- 2) Size
- 3) Thickness
- 4) Weight

b. Helmet Shell:

- 1) Type of resin employed
- 2) Number of interior and exterior plies
- 3) Finish

c. Electrical Equipment:

- 1) Microphone type
- 2) Boom length
- 3) Impedance
- 4) Connector type
- 5) Connecting cord length
- 6) Headset type

6.1.5 Operator Training and Familiarization

Test personnel shall receive training and familiarization in accordance with applicable procedures of MTP 10-2-501 and the following:

a. Familiarize the test team concerning the purpose and methods required to test aviation helmets. The following topics should be stressed:

- 1) Sequence of Tests and Adjustment: Tests and adjustments should be carried out in the specified order so that factors affecting each test will have been established and re-testing and re-adjustment will be reduced or eliminated.
- 2) Test Equipment - Ensure that each team member understands the requirement for each specified test equipment and test fixture.
- 3) Terminology: Familiarize team members with trade terms and unique state-of-the-art terminology not otherwise defined in the supplied instructional matter.
- 4) Hazards: Review all hazards and safety precautions associated with operating, maintaining, and testing the test item.

b. Personnel who do not demonstrate adequate understanding of the material presented shall receive additional instruction and their identity shall be recorded as described in MTP 10-2-501, along with the degree of retraining required.

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6.2 TEST CONDUCT

NOTE: All equipment malfunctions shall be reported in accordance with USATECOM Regulation 70-23.

Test personnel shall observe all normal safety precautions governing the operation of the test item and test equipment.

6.2.1 Helmet Shell Performance Tests

Determine the degree of protection offered by the test item under simulated crash and/or high impact situations in the presence of ambient or extreme environments, by performing the following:

6.2.1.1 Impact Performance Test

NOTE: The test item visor assembly should be removed for this test.

Subject the headgear to the impact resistance tests as described in ANSI Z 90.1-1966, and the following as appropriate:

a. Prepare a suitable drop-type impact machine, with head form, accelerometer, and recording equipment as described in Appendix A.

b. Fit the test item on the head form using only provided test item straps or fasteners, orient the form for the initial impact, measure and record the following:

- 1) Head form axis angle with horizontal plane, and orientation.
- 2) Weight and dimensions of head form, as required for calculation of moment of inertia.
- 3) Weight and spherical radius of impact weight.
- 4) Intended height of weight drop.

c. Release the impact weight on the specified point, inspect the test item, and perform the following:

- 1) Record the accelerometer reading, and/or identity of oscillogram(s).
- 2) Record visual evidence of damage to test item, or other details which would supplement numerical test data.
- 3) Retain oscillogram(s).

d. Repeat steps b and c for each required point of impact. Unless otherwise specified, the test helmet shall be impacted in the front, both sides, and rear. Retain oscillograms of each drop test.

6.2.1.2 Penetration Resistance Test

a. Mount the test item on a suitable head form with the visor removed.

b. Divide the helmet into six, 60-degree sectors in respect to test item apex.

c. Measure radially from the test item apex for a distance of 4-1/2 inches.

d. Devise a means for dropping a pointed 16-ounce plumb bob (see item e.3 of paragraph 3) from a height of ten feet onto the outside surface of the helmet in a direction perpendicular to the surface, within each sector, at the specified radial distance, and at the apex.

e. Complete the seven plumb bob drops described in step d above, and record the following:

- 1) Plumb bob particulars: weight, hardness, point degrees, etc.
- 2) Location of each plumb bob impact point in respect to the requirements of step a above.
- 3) The distance to which the plumb bob penetrated and protruded on the inside of the test item.
- 4) Details of the test which would supplement the numerical data collected.

6.2.1.3 Wind Blast Resistance Test

a. Fit the test item onto a head form, firmly mounted to a fixed platform, within a wind tunnel or equivalent wind simulating machine (see item e.5 of paragraph 3) and record the actual capability of the wind tunnel as follows:

- 1) Maximum windspeed attainable
- 2) Time required to change windspeed, per 100 mph

b. Orient the test item initially for a head-on blast of simulated wind. The test item visor shall be in a secured, full down position. Straps and sizing pads shall be utilized to obtain a reasonable fit. Record the orientation.

c. Subject the test item to a 3-second duration wind blast, equivalent to 520 mph, or as otherwise specified, with the maximum air blast decaying to 350 mph within 3 seconds. Record the duration, and maximum windspeed attained.

d. Visually inspect the test item during, and after the blast and record evidence of any effects, in particular as follows:

- 1) Test item tore away from the head form.
- 2) Visor rose, became loose, or broke away.
- 3) Helmet damage, dislocation of the visor, visor lock, chin strap assembly, and retention release assembly.
- 4) Evidence that helmet edge beading, or equivalent, separated from the shell at any point.

e. Following the head-on test, repeat steps b through d for each test item orientation, as follows:

- 1) Second blast: head on, 45 degrees turned to right.
- 2) Third blast: head on, 45 degrees tilted back.
- 3) Fourth blast: tilted back, 45 degrees and turned to the left

45 degrees.

6.2.1.4 Heat Aging Test

a. Measure and record the weight of the test item, and the distance between convenient reference points on the surface of the helmet.

b. Place the test item on its crown in a circulating air type oven (see item e.6 of paragraph 3) and subject the test item to $160^{\circ}\text{F} \pm 5^{\circ}\text{F}$ for a period of 4 hours, or as otherwise specified. Record actual values of temperature, and period of exposure.

c. Remove the test item and place a balance located within a chamber conditioned to $75 \pm 2^{\circ}\text{F}$ and at a relative humidity of $50 \pm 4\%$. Continue this treatment until the test item has attained constant weight. Record actual values of temperature, humidity, and period of exposure.

d. Repeat the weight and distance measuring of step a, and determine the change, if any, in test item weight, and distance between reference points.

e. Inspect the test item and record any evidence of effects of the test, in particular as follows:

- 1) Appreciable distortion of helmet components
- 2) Defects in finish
- 3) Failure of cemented parts

6.2.2 Visor Performance Tests

Determine the optical characteristics of the test item helmet visor by performing the following:

- NOTE:
1. Helmet visors are used by Army flight personnel to protect their eyes from wind blast, sunlight, and electromagnetic radiations.
 2. Lenses for aviation visors are of three classes as defined be MIL-V-22272; accordingly, references in this document regarding the applicability of tests will be based on the following:
 - a. Class 1: Clear visor lens
 - b. Class 2: Neutral gray visor lens
 - c. Class 3: Gold coated visor (99% filter) lens

6.2.2.1 Light Transmittance Test

Determine the ratio of luminous flux transmitted by the visor lens, to the luminous flux incident, using Method 3022 of FED-STD-406 which is summarized by the following procedures:

a. Prepare a pivotable-sphere hazemeter, or equivalent, as illustrated by Figure 1, and as follows:

- 1) For visor lens classes 1 and 2, use illuminant "A" as the light source (2,848 degrees K).

- 2) For visor lens class 3, use illuminant "C" (3,100 degrees K) and cooling as required, and the following, as necessary to compensate for the expected low transmittance:
 - a) The galvanometer should be calibrated with a 1.5 neutral density filter to give a full scale deflection.
 - b) A 2.0 density filter should also be used to determine the 1-percent point on the scale.
- 3) Apply power to the source lamp. Record the voltage and current values required to obtain the proper operating color temperature.

b. Prepare a test item visor material specimen approximately 1.5 inches in diameter minimum, and small enough to be tangent to the integration sphere (Figure 1-A). Record specimen diameter and thickness to the nearest 0.0001 inch.

c. Insert the specimen, light trap, and reflectance standard as shown in Figure 1, in the sequences as required by Table I for each reading. Measure and record the readings designated as T_1 , T_2 , T_3 , and T_4 in Table I below:

TABLE I: TEST-CYCLE

| Reading designation | Specimen in position | Light trap in position | Reflectance standard in position | Quality represented |
|---------------------|----------------------|------------------------|----------------------------------|---|
| T_1 | No | No | Yes | Incident light |
| T_2 | Yes | No | Yes | Total light transmitted by specimen. |
| T_3 | No | Yes | No | Light scattered by instrument. |
| T_4 | Yes | Yes | No | Light scattered by instrument and specimen. |

d. Repeat step c above for a minimum of five test cycle. A test cycle is identified as the determination of the four values as described in Table I above, for the required combinations of the specimen, light trap, and reflectance standard.

NOTE: Procedures for determining the required ratio are given in paragraph 6.4.2.1 below.

6.2.2.2 Optical Distortion of Critical Area Test

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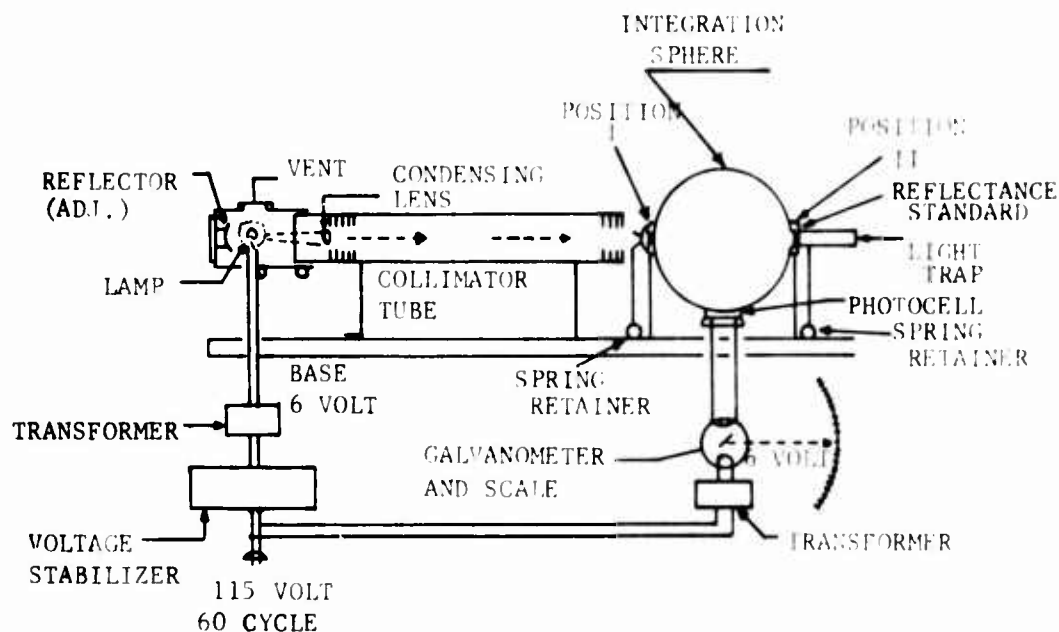


Figure 1A: Hazemeter

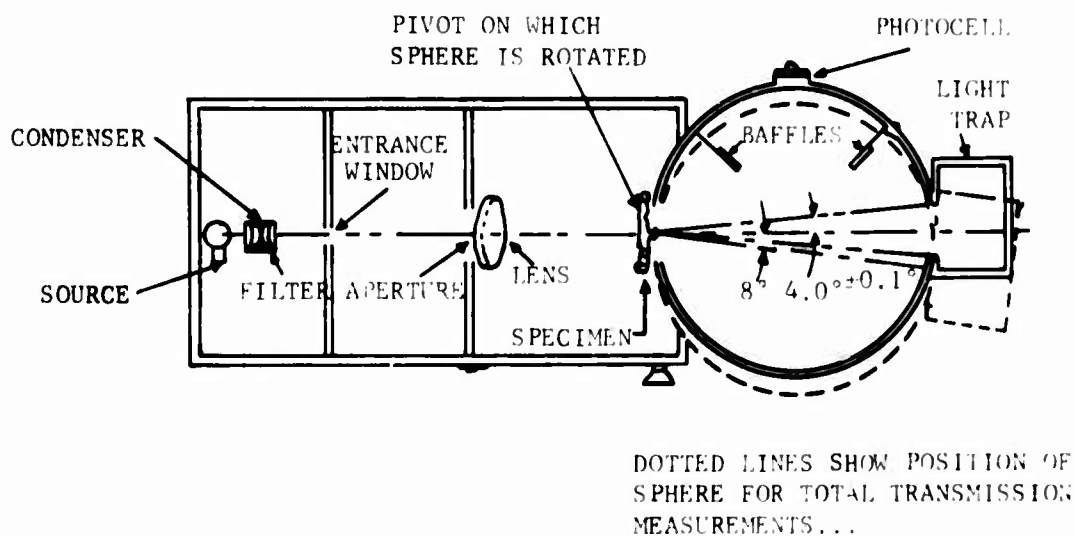


Figure 1B: Typical Pivotal-Sphere Hazemeter as Required for Determination of Total Luminous Transmittance and Diffuse Luminous Transmittance.

a. Prepare an optical tester, and the test item visor as described and illustrated by Figure 2:

- 1) Insert the test item visor lens in the holder provided by the test apparatus such that:
 - a) The lens surface is normal to the line of sight generated by test apparatus optical components.
 - b) The line of sight will pass through a specified critical area of the visor.
- 2) Apply power to the optical tester and view the light rays reflected from the first surface mirror. The off-parallelism will constitute the amount of distortion present.

b. Compare the image observed as described in step a above with each plate as illustrated in Figure 3 and record the following:

- 1) Identity of critical area examined.
- 2) Identity of comparison plate which matches the observed image.
- 3) Finding for the critical area (acceptable or unacceptable) or other evidence of unacceptable distortion.

c. Repeat the procedures above for each remaining visor critical area to be tested (See Figure 4).

- NOTE:
1. Figures 3 and 4 were taken directly from the Pilot Visors Distortion Standards of MIL-L-38169 (USAF).
 2. An equally acceptable method for determining optical distortion is the use of a vertometer. The degree of power, prism, and cylinder also can be determined by the instrument. See paragraph 3.f.2 above.

6.2.2.3 Neutrality Test

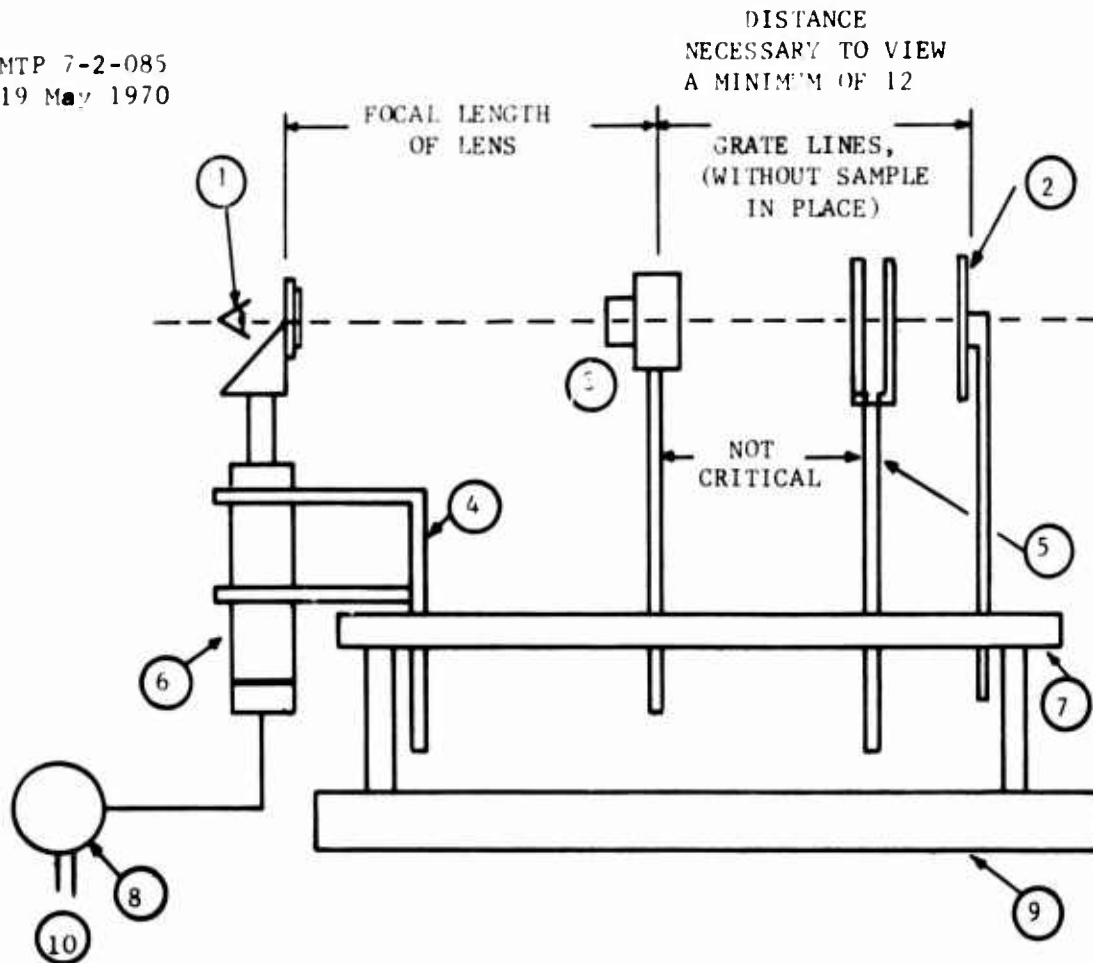
For the test item class 2 visor (neutral gray), determine the average percentage deviation of spectral transmittance within nine spectral bands between 430 and 730 millimicrons (μ) by application of the Judd Day-Light Duplication Method, as illustrated by the following procedures:

- a. Prepare the test item, and a suitable spectrophotometer with monochromator (see item 3.f.3 of paragraph 3), using illuminant "C" of the International Commission on Illumination.
- b. Measure the test item transmittance "T" at 10 μ intervals beginning with 430 μ , through 730 μ .
- c. Record the following:

- 1) Range, and bandwidth of the spectrophotometer employed
- 2) Value of transmittance T, as measured for each wave length

NOTE: Procedures for determining the required average are given

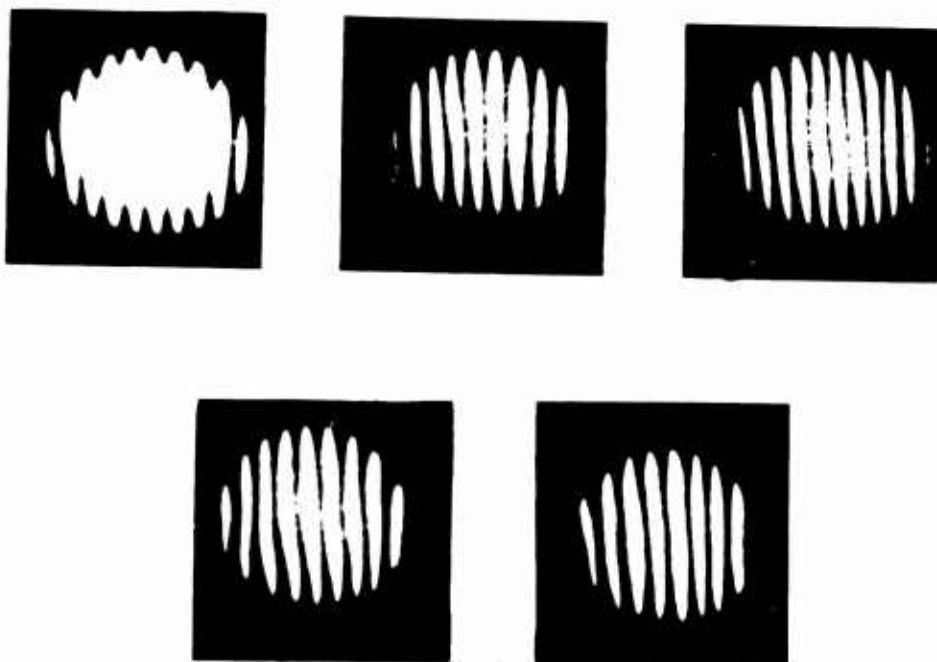
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| ITEM | DESCRIPTION |
|------|---|
| 1 | POSITION OF EYE FOR DIRECT VIEWING. |
| 2 | FIRST SURFACE PLANE MIRROR. |
| 3 | TELEPHOTO CAMERA LENS 1:5.5/240MM, COLOR COATED, BARREL ONLY. |
| 4 | SUPPORT FOR OPTICAL TESTER. |
| 5 | SUPPORT AND HOLDER FOR TEST ITEM VISOR LENS. |
| 6 | OPTICAL TESTER WITH 60-LINE GRATING AND TYPE "O" OPTICAL BENCH ADAPTER. |
| 7 | OPTICAL BENCH. |
| 8 | VARIABLE VOLTAGE TRANSFORMER. |
| 9 | TABLE TOP. |
| 10 | POWER LINE. |

Figure 2. Aviation Helmet Visor Lens Optical Distortion Test Set-Up, Typical.

ACCEPTABLE



UNACCEPTABLE

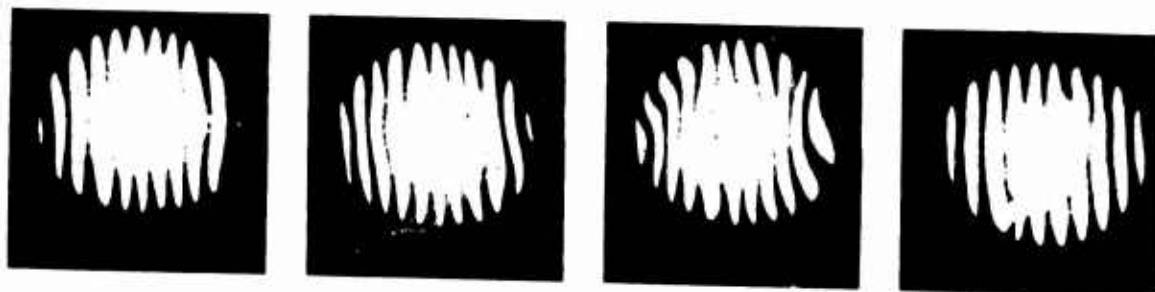


FIGURE 3: COMPARISON PLATES TO BE USED IN THE DETERMINATION OF
TEST ITEM OPTICAL DISTORTION OF THE CRITICAL AREA.

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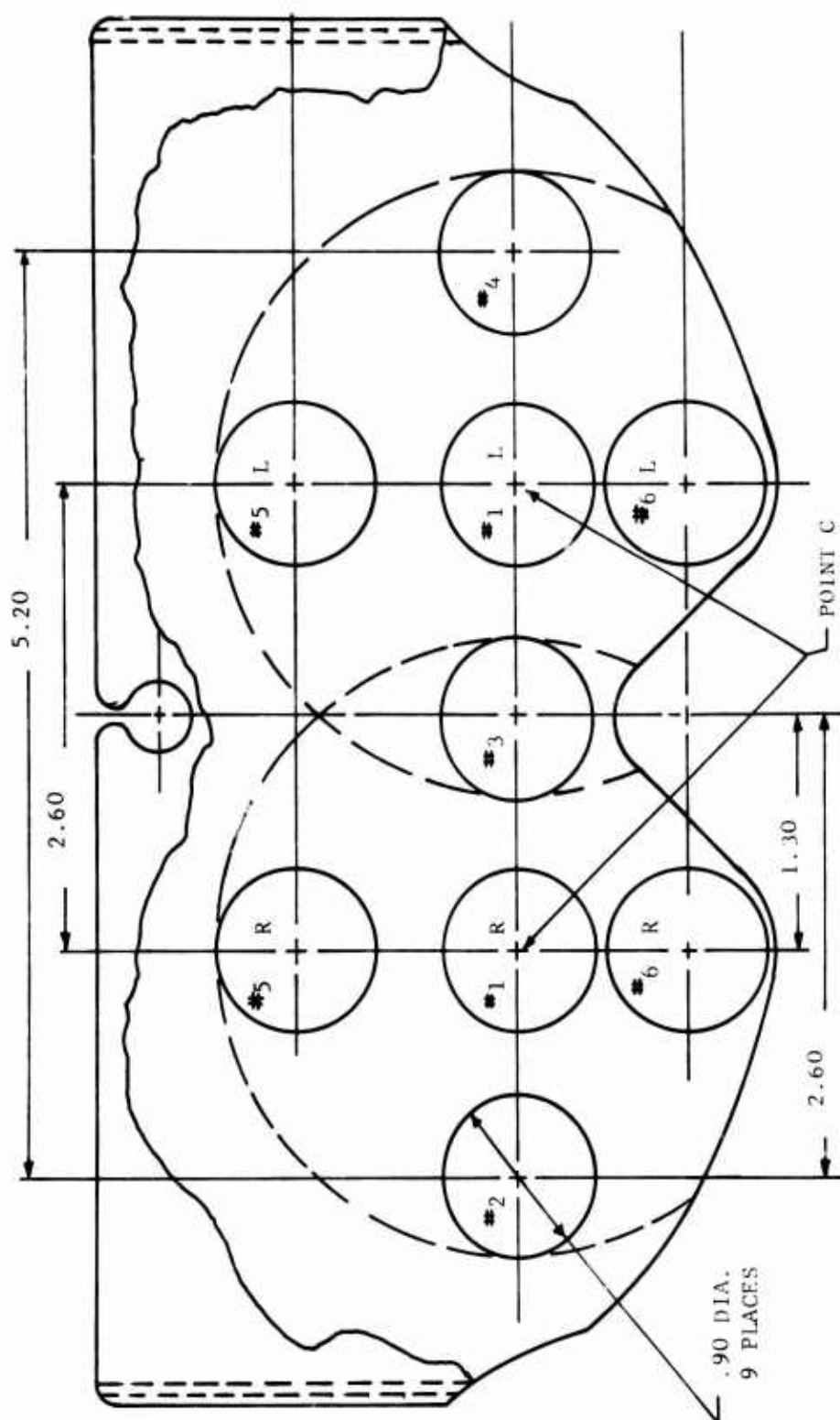


Figure 4. Critical And Noncritical Visor Areas.

in paragraph 6.4.2.2 below.

6.2.2.4 Chromaticity

- a. Determine and record the chromaticity coordinates, x and y, for test item Class 2 visor (neutral gray), using the Method of Spectrophotometric Measurement for Color, in accordance with ANSI Z 58.7.1-1951.
- b. Subject the test item visor to the Accelerated Weathering Test, Method 6022 of Federal Test Method Std. No. 406.
- c. Repeat step a above, and note any change in the x and y coordinates.

6.2.2.5 Extended Electromagnetic Radiation Transmittance Test

Verify that the total transmittance of electromagnetic radiation of the test item class 3 visor (gold coated), in the range between 200 and 2500 millimicrons (μ) is no greater than one percent or as otherwise specified as follows:

- a. Prepare a suitable test set-up, including an automatic recording spectrophotometer with a monochromator (see item f.4 in paragraph 3) and record the type, and range of instrument used.
- b. Conduct the analysis for the left, and right points on the visor, marked "C" on Figure 4. Identify the following on each chart recording:
 - 1) Base line curve for transmittance in air, without visor.
 - 2) Curve for transmittance through specified point on visor (left, or right point C).
 - 3) Evidence of any area(s) in excess of specified tolerance.
- c. Subject the test item visor to the Accelerated Weathering Test, Method 6022 of Federal Test Method Std. No. 406.
- d. On completion of weathering, repeat the transmittance test of step b above, and note any change in performance as indicated by chart recordings for the same area.

6.2.2.6 Adhesion and Abrasion Resistance of Metallic Film Test

Subject the test item visor to the procedures of MIL-V-22272B, Visors, Protective, Helmet which pertain to the testing of coated visor lens. These procedures are summarized below:

- a. Adhesion of metallic film:
 - 1) Press firmly a strip of pressure sensitive transparent tape (see item f.5 of paragraph 3) 6 inches long across the width of the visor.
 - 2) Remove the tape from the visor lens with a quick, snap action which would tend to exert the greatest possible stripping effect on the lens coating.

- 3) Inspect the lens closely and record evidence of stripped coating or other effects of the test, and the adhesion value of the tape used.

b. Abrasion resistance:

- 1) Rub an approved optical abrasion tester (see item f.6 of paragraph 3) across the surface of the coated test item visor lens from one point to another, over the same path, for twenty complete cycles with a force of 2.0 to 2.5 pounds continuously applied.
- 2) Following the twenty cycle test, clean the lens and inspect with the normal unaided eye. Record any evidence of abrasion or removal of coating, and the type of tester employed.

6.2.3 Helmet Communications, and Sound Attenuation

6.2.3.1 Microphone Electrical Characteristics Test

Determine and record test item microphone electrical characteristics of impedance, breakdown voltage, sensitivity, frequency response, and harmonic distortion in accordance with applicable procedures of MTP 6-2-110.

6.2.3.2 Helmet Mounted Headset Test

Determine and record test item headphone electrical characteristics of D-C resistance, acoustical distortion, and sound attenuation in accordance with applicable procedures of MTP 6-2-115.

6.2.3.3 Word Articulation Test

Determine the acoustic characteristics of the test item microphone which affect the distinct transmission of the human voice by performing applicable word articulation tests in accordance with Office of Scientific Research and Development Report No. 3802 and the following:

a. A minimum of two talkers and five listeners should be employed for the test, using a representative aircraft intercommunication set in normal operation, in the presence of noise produced by an aircraft noise simulator, at sound levels as specified in the applicable requirements document, or as follows:

- 1) Turbo/conventional propeller-type aircraft noise having any level up to and including 120 db at ground level and at a simulated altitude of 15,000 feet.
- 2) Maximum sound levels such as those specified for Army aircraft in MIL-A-8806A.

b. Each test should include a sufficient number of words to assure that the resulting scores are statistically significant.

c. Record the following for each test:

- 1) Number of talkers employed
- 2) Number of words used
- 3) Type of aircraft intercommunications set used or simulated
- 4) Noise levels used for background, in db
- 5) Simulated altitude

d. Upon completion of the microphone test, verify the test item headset reception when used with the test item microphone.

6.2.3.4 Helmet Sound Attenuation

Determine the sound attenuation characteristics of the test item helmet in accordance with the following criteria:

- a. Applicable requirements documents, which may specify attenuation values, or maximum sound levels as specified for Army aircraft in MIL-A-8806A.
- b. Procedures for quantitative measurement such as those of USAARU Report 67-8, which includes ANSI Z 24.22-1957.

6.2.3.5 Explosive Decompression Test

- a. Place the test item in an altitude chamber capable of maintaining a pressure equivalent to an altitude of 20,000 feet and less, and of simulating a complete decompression (change of pressure) within 0.1 second or less. Record the capabilities of the chamber used.
- b. Subject the test item to ten consecutive explosive decompressions from an altitude of 8,000 feet to 20,000 feet. Record actual conditions under which the tests were conducted, including time required for change of pressure.
- c. Following chamber tests, inspect the test item and record any evidence of mechanical damage, or other effects.
- d. Repeat the electrical characteristics tests of paragraph 6.2.3.1 and 6.2.3.2 and record data as required.

6.2.4 Environmental Effects Tests

Determine test item's ability to withstand the extreme factors imposed by accelerated climatic and environmental conditions and continue to function as intended, by conducting the following:

- a. Subject the test item to the following procedures of MIL-E-5272:
 - 1) Humidity Test, Procedure I
 - 2) Salt Spray Test, Procedure I
 - 3) Fungus Resistance Test, Procedure I
 - 4) Sunshine Test, Procedure I
 - 5) Sand and Dust Test, Procedure I
- b. Following each test of step a, disassemble and inspect the test item, and record any evidence of adverse effects.
- c. Following the humidity test and the sand and dust test, repeat

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the microphone and headphone electrical performance tests of paragraphs 6.2.3.1 and 6.2.3.2 above, and record data as required.

d. Following the salt spray test and sunshine test, repeat the visor performance tests of paragraph 6.2.2 above, and record data as required.

6.2.5 Transportability

Subject the test item to applicable procedures of MTP 10-2-503 and the following:

- a. Visually inspect the test item prior to testing, and record any evidence of defects.
- b. Pack the test item as specified for shipment.
- c. Subject the test item to the drop test and vibration procedures given in Methods 5007 and 5019 respectively of FED-STD-101.

- NOTE:
- 1. For packaged test item weights of 1000 pounds or less, the floor of the facility receiving the impact shall be of solid wood 2 inches thick (fir backed by concrete or rigid steel).
 - 2. The number and height of drops can be determined by entering the table with the test item-transit case combined weight and the transit case dimensions.

d. Upon completion of the test, the test item shall be inspected visually for damage and will be operated under normal conditions to determine if there has been change in performance. Record the results of the visual inspection and evidence of any change in test item operational performance.

6.2.6 Maintenance

Evaluate the maintenance-related factors of the test item as described in MTP 10-2-507 and MTP 10-2-512 with emphasis on the following:

- a. Organizational (O), Direct Support (F), and General Support (H) Maintenance requirements.
- b. Operator through General Support Maintenance Literature.
- c. Repair parts.
- d. Tools.
- e. Test and handling equipment.
- f. Calibration and maintenance facilities.
- g. Personnel skill requirements.
- h. Maintainability.
- i. Reliability.
- j. Availability.

6.2.7 Safety

Perform applicable procedures of MTP 10-2-508; determine and record data required by that MTP and the following:

- a. Any dangerous or unsafe condition or any condition that might present a safety hazard including the cause of the hazard, and the steps taken to alleviate any such hazard.
- b. The safety features incorporated into test item design.
- c. Adequacy of warning instructions and markings.
- d. Suggestions to improve the existing safety precaution.

6.2.8 Human Factors Evaluation

Throughout the test, evaluate the effectiveness and characteristics of the man-item interaction as related to human factors by performing the applicable sections of MTP 10-2-505 and the following:

a. Prepare checklists to evaluate the human factor characteristics using Human Factors Evaluation Data for General Equipment (HEDGE) for the Class IV C equipment, including the following:

- 1) Operability:
 - a) Don and doff
 - b) Utilizing helmet and attachment of external connections
 - c) Controls and indicators:
 - (1) Fit and adjustment
 - (2) Readiness and maintenance
 - (3) Placement and balance
 - (4) Compatibility with other equipment
 - (5) Task compatibility
 - (6) Visibility of markings
 - d) Ease of controlling and adjusting test item when installed and operating.
- 2) Performance characteristics which did not conform to recognized human factors design criteria.
- 3) Considerations to be included in checklist for the maintenance evaluation:
 - a) Ease of locating malfunction and determination of cause
 - b) Access to defective component
 - c) Ease of replacement and/or repair of malfunction
- 4) Transportability:
 - a) Removal of internal of external components for transport
 - b) Breakdown and reassembly of test item

b. Evaluation of the tasks of step a shall include but not be limited to the following:

- 1) Title of task conducted

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- 2) Adequacy of instructions and tools furnished to perform task
- 3) Ease of performing task
- 4) Human factors design deficiency revealed by particular test
- 5) Time and personnel required for task
- 6) Any recommendations to improve man-item effectiveness

6.2.9 Value Analysis

Throughout all tests, the test item shall be examined for any unnecessary, costly, "nice-to-have" features as described in USATECOM Regulation 700-1. Perform the following:

- a. During operation of the test item, observe for features which could be eliminated without compromising performance, reliability, durability, or safety.
- b. Question test personnel regarding features of the test item which could be eliminated without decreasing the functional value of the test item or decrease man-item effectiveness.
- c. Record the following:
 - 1) Non-functional, costly, or "nice-to-have" features of the test item.
 - 2) Test performance comments and opinions regarding features to be eliminated.

6.2.10 Quality Assurance

Determine the quality of the test item as described in the applicable sections of MTP 10-2-511.

6.3 TEST DATA

6.3.1 Preparation for Test

6.3.1.1 Initial Inspection

Record data collected as described in the applicable sections of MTP 10-2-500, and the following:

- a. Evidence of damage incurred during transport or storage.
- b. Exterior identification markings not in accordance with MIL-STD-129 or other governing documents.
- c. Interior marking(s) of shipment not in accordance with MIL-STD-129 or other governing documents (following test item being unpacked).
- d. Evidence of defects in test item materials and construction, treatment and finish, and/or workmanship.

6.3.1.2 Inventory Check

Record evidence of the following after inventory against the BILL:

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- a. Missing maintenance literature or draft technical manuals
- b. Shortages in repair parts, accessories, or tools (authorized tools)
- c. Missing kits

6.3.1.3 Inspection and Preliminary Operation

Record the following:

- a. Evidence of any failure of the test item to conform to requirements and specifications, as indicated.
- b. Evidence of errors in test item nomenclature, warning and instructional data, and/or missing plates, as required by MIL-STD-130.

6.3.1.4 Physical Characteristics

Record the following:

- a. Data required by applicable procedures of MTP 10-2-500 and MTP 6-2-500.

b. Visor:

- 1) Type (Class 1, 2 or 3)
- 2) Size
- 3) Thickness of lens, in inches
- 4) Weight, in ounces

c. Helmet shell:

- 1) Type of resin employed
- 2) Number of interior and exterior plies
- 3) Finish (enamel, etc.)

d. Electrical equipment:

- 1) Microphone type (carbon, etc.)
- 2) Boom length, in inches
- 3) Impedance, in ohms
- 4) Connector type, i.e., nomenclature
- 5) Connecting cord length, in inches
- 6) Headset type

6.3.1.5 Operator Training and Familiarization

Record the following:

- a. Data collected as described in the applicable sections of MTP 10-2-501.
- b. Identity of personnel requiring retraining, and degree of retraining required.

6.3.2 Test Conduct

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6.3.2.1 Helmet Shell Performance Tests

6.3.2.1.1 Impact Performance Test -

a. Record the following:

- 1) Data collected as described by applicable sections of ANSI Z 90.1-1966.
- 2) For each drop-type impact:
 - a) Head form axis angle with horizontal plane.
 - b) Orientation (front, side, rear) for impact on helmet.
 - c) Weight of head form, in pounds.
 - d) Dimensions of head form, in inches.
 - e) Weight of impact device, in pounds.
 - f) Spherical radius of impact weight, in inches.
 - g) Intended height of weight drop, in inches.
 - h) Accelerometer reading, and/or identity of oscillogram(s).
 - i) Evidence of damage to the test item or other details which would supplement the numerical test data.

b. Retain oscillograms of each impact test

6.3.2.1.2 Penetration Resistance Test -

Record the following:

a. For plumb bob:

- 1) Weight, in ounces
- 2) Composition (e.g., steel)
- 3) Angle of point, in degrees
- 4) Radius of point, in inches
- 5) Rockwell hardness number (e.g., C60)

b. For each drop:

- 1) Location of plumb bob impact point.
- 2) Distance to which the plumb bob penetrated the helmet shell.
- 3) Details of the test which would supplement the numerical data collected.

6.3.2.1.3 Wind Blast Resistance Test -

Record the following:

a. For wind tunnel provided:

- 1) Maximum windspeed attainable, in miles per hour.
- 2) Time, in seconds, required to change windspeed, per 100 miles

per hour.

b. For each test:

- 1) Orientation of test item for each blast (e.g., head-on, 45 degrees turned to right).
- 2) Wind blast duration, in seconds.
- 3) Maximum windspeed attained, in mph.
- 4) Evidence of any of the following (or other effects of wind blast):
 - a) Test item tore away from the head form.
 - b) Visor rose, became loose, or broke away.
 - c) Helmet damage, dislocation of the visor, visor lock, chin strap assembly, and retention assembly.
 - d) Evidence that helmet edge beading, or equivalent, separated from the shell at any point.

6.3.2.1.4 Heat Aging Test -

Record the following:

a. Before heat aging:

- 1) Weight of test item, in pounds and ounces
- 2) For each distance measurement:
 - a) Identity of reference points
 - b) Distance between points, in inches

b. For circulating air oven:

- 1) Temperature, in degrees F
- 2) Period of exposure, in hours

c. For humidity chamber:

- 1) Temperature, in degrees F.
- 2) Initial relative humidity, in percent.
- 3) Number of hours required for test item to attain constant weight.

d. For measurements after exposure:

- 1) Weight, in pounds and ounces.
- 2) Distance(s), in inches, between specified points.
- 3) Change (increase/decrease) with respect to data of step a above, for:
 - a) Weight, in ounces
 - b) Distance(s), in inches

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a. Following visual inspection:

- 1) Appreciable distortion of helmet components
- 2) Defects in finish
- 3) Failure of cemented parts

6.3.2.2 Visor Performance Tests

6.3.2.2.1 Light Transmittance Test -

Record the following for each type of visor:

- a. Type of apparatus used
- b. Class of visor tested (1,2, or 3)
- c. Operating color temperature, in degrees K
- d. Lamp power required to obtain proper color temperature:

- 1) Voltage, in volts
- 2) Current, in amperes

e. Dimensions of visor specimen:

- 1) Diameter, in inches
- 2) Thickness, to nearest 0.0001 inch

- f. Measured values of transmittance (reading designations T_1 , T_2 , T_3 , T_4) for each test cycle, as described in Table I of paragraph 6.2.2.1 above.
- g. Number of test cycles conducted.

6.3.2.2.2 Optical Distortion of Critical Area Test -

Record the following for each visor area:

- a. Identity of critical area examined, as described by Figure 4.
- b. Identity of comparison plate, as shown in the distortion guide provided by Figure 3, whenever a match of test item image occurs.
- c. Finding for the critical area (acceptable, or unacceptable), or other evidence of unacceptable distortion.
- d. Type of apparatus used (as described by Figure 2, or by Note 2 of paragraph 6.2.2.2 above.

6.3.2.2.3 Neutrality Test

- a. Range, and bandwidth of the spectrophotometer employed, in millimicrons (μ):

- 1) Upper limit
- 2) Lower limit
- 3) Bandwidth

- b. Measured values of test item transmittance (T) for each 10 mu, over the range, beginning with a wavelength of 430 mu, through 730 mu.

6.3.2.2.4 Chromaticity -

Record the chromaticity coordinates, x and y, for Class 2 Visors:

- a. Prior to accelerated weathering testing
- b. After accelerated weathering testing

6.3.2.2.5 Extended Electromagnetic Radiation Transmittance Test -

- a. Record the following:

- 1) Type of automatic spectrophotometer employed, and range, in millimicrons (mu).
- 2) For each visor area tested, before weathering:
 - a) Identity of chart recording
 - b) Identity of visor area tested (left, or right point C)
 - c) Whether or not the area conforms to specification
- 3) For each visor area tested, after weathering:
 - a) Data collected as described in step 2 above.
 - b) Evidence of any change in performance as indicated by chart recordings for the same area.

- b. Retain all chart recordings

6.3.2.2.6 Adhesion and Abrasion Resistance of Metallic Film Test -

Record the following:

- a. For the adhesion test:

- 1) Any evidence of visor coating stripped or otherwise damaged
- 2) Adhesion value of tape used, in ounces per inch of width

- b. For abrasion resistance:

- 1) Evidence of abrasion or removal of coating, after the twenty cycle test.
- 2) Type of tester employed.

6.3.2.3 Helmet Communications, and Sound Attenuation

6.3.2.3.1 Microphone Electrical Characteristics Test -

Record data collected for the following characteristics as described

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by the applicable sections of MTP 6-2-110:

- a. Impedance, in ohms
- b. Breakdown voltage
- c. Sensitivity
- d. Frequency response
- e. Harmonic distortion

6.3.2.3.2 Helmet Mounted Headset Test

Record data collected for the following characteristics, as described by the applicable sections of MTP 6-2-115:

- a. D-C resistance, in ohms
- b. Acoustical distortion
- c. Sound attenuation in db

6.3.2.3.3 Word Articulation Test -

Record the following for each test:

- a. Number of talkers employed
- b. Number of words used
- c. Type of aircraft intercommunications set used
- d. Noise levels used for background, in db
- e. Simulated altitude

6.3.2.3.4 Helmet Sound Attenuation -

Record the following:

- a. Identity of test performed (as required)
- b. Data collected (as applicable)

6.3.2.3.5 Explosive Decompression Test -

Record the following:

- a. Capabilities of the chamber used.
- b. Number of simulated explosive decompressions run.
- c. Actual conditions imposed:
 - 1) Change of altitude, in inches of mercury
 - 2) Length of time, in seconds required for change of pressure
- d. Mechanical damage, and other effects, as noted during inspection.
- e. Electrical characteristics data collected as described by paragraphs 6.2.3.1 and 6.2.3.2 above.

6.3.2.4 Environmental Effects Tests

Record the following:

a. Data collected as described by MIL-E-5272 for each of the following tests:

- 1) Humidity test
- 2) Salt spray test
- 3) Fungus resistance test
- 4) Sunshine test
- 5) Sand and dust test

b. Evidence of any adverse effects of the foregoing tests on the physical characteristics of the test item.

c. Electrical characteristics data collected as described by paragraphs 6.2.3.1 and 6.2.3.2 above.

d. Visor performance data collected as described by paragraph 6.2.2 above.

6.3.2.5 Transportability

Record the following:

a. Evidence of any defects prior to testing.

b. Data collected as required by applicable procedures of MTP 10-2-503.

c. Description of damage visually noted following drop test.

d. Evidence of inferior or changed test item performance during operational usage following:

- 1) Drop test
- 2) Vibration test

6.3.2.6 Maintenance Evaluation

Record data collected as described in the applicable sections of MTP 10-2-507 and MTP 10-2-512.

6.3.2.7 Safety

Record data collected as described in the applicable sections of MTP 10-2-508, and the following:

a. Any dangerous or unsafe condition or any condition that might present a safety hazard including the cause of the hazard.

b. Safety features incorporated into test item design.

c. Adequacy of warning instructions and markings.

d. Suggestions to improve the existing safety precautions.

6.3.2.8 Human Factors Evaluation

a. Record data collected as required by applicable procedures of

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MTP 10-2-505.

- b. Retain all completed checklists.

6.3.2.9 Value Analysis

Record the following:

- a. Non-functional, costly, or "nice-to-have" features of test item.
- b. Test personnel comments and opinions regarding features which could be eliminated in accordance with criteria of USATECOM Regulation 700-1.

6.3.2.10 Quality Assurance

Record data collected as described in the applicable section of MTP 10-2-511.

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 Helmet Shell Performance Tests

Calculate moment of head form inertial and plot curves and demonstrate shell capability as applicable. Where alternate helmets were tested at the same time and under the identical conditions, performance data should be presented collectively.

6.4.2 Visor Performance Tests

Illustrate visor performance data in a way which indicates response to requirements documents. Attempt to show performance in graphic form whenever possible.

6.4.2.1 Light Transmittance

For each class of visor lens tested, determine the ratio of luminous flux transmitted by the lens, to the luminous flux incident, based on the data required by paragraph 6.2.2.1, and the following:

- a. Calculate the total luminous transmittance, T_t , as follows:

$$T_t = \frac{T_2}{T_1} \quad \text{where,}$$

T_1 = Incident light

T_2 = Total light transmitted by specimen

- b. Calculate diffuse luminous transmittance, T_d , as follows:

$$T_d = \frac{T_4 - T_3 (T_t)}{T_1} \quad \text{where,}$$

T_4 = Light scattered by instrument and specimen
 T_3 = Light scattered by instrument
 T_t - Total luminous transmittance

6.4.2.2 Neutrality

For the Class 2 visor (neutral gray), determine the average percentage deviation of spectral transmittance within nine spectral bands, based on the data required by paragraph 6.2.2.3, and the following:

a. Enter each measured value of test item transmittance under the T column of Table II below, opposite the indicated wavelength (mu):

TABLE II: TYPICAL DATA COLLECTION FOR COMPUTATION OF SPECTRAL TRANSMITTANCE DEVIATIONS

| Wave length (mu) | T | Band n | Wave length range | Average transmittance T_n | Percent deviation 100 (1- T_n / T_c) | Weight | Product |
|------------------|---|--------|-------------------|-----------------------------|---|--------|---------|
| 430 | | | | | | | |
| 440 | | | | | | | |
| 450 | | | | | | | |
| 460 | | 1 | 430-490 | | | 5 | |
| 470 | | | | | | | |
| 480 | | | | | | | |
| 490 | | 2 | 460-520 | | | 10 | |
| 500 | | | | | | | |
| 510 | | | | | | | |
| 520 | | 3 | 490-550 | | | 10 | |
| 530 | | | | | | | |
| 540 | | | | | | | |
| 550 | | 4 | 520-580 | | | 10 | |
| 560 | | | | | | | |
| 570 | | | | | | | |
| 580 | | 5 | 550-610 | | | 10 | |
| 590 | | | | | | | |
| 600 | | | | | | | |
| 610 | | 6 | 580-640 | | | 10 | |
| 620 | | | | | | | |
| 630 | | | | | | | |
| 640 | | 7 | 610-670 | | | 10 | |
| 650 | | | | | | | |
| 660 | | | | | | | |
| 670 | | 8 | 640-700 | | | 5 | |
| 680 | | | | | | | |
| 690 | | | | | | | |
| 700 | | 9 | 670-730 | | | 1 | |
| 710 | | | | | | | |
| 720 | | | | | | | |
| 730 | | | | | | | |
| | | | | | Total | - | - |

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b. Compute average transmittance, T_n , for each band, n , using the values recorded under T for each wavelength of the band. Record the computed value under Average Transmittance column of Table II opposite the indicated bandwidth.

NOTE: 1. The computation for Band 1, 430 through 490 mμ, is illustrated as an example; bands 2 through 9 are treated in an identical fashion. Assume, for the purpose of explanation, that the following values of T were obtained with the spectrophotometer in step a above:

| | |
|---------|------------------|
| 430 mμ: | $T_{11} = 0.114$ |
| 440 mμ: | $T_{12} = 0.118$ |
| 450 mμ: | $T_{13} = 0.127$ |
| 460 mμ: | $T_{14} = 0.137$ |
| 470 mμ: | $T_{15} = 0.142$ |
| 480 mμ: | $T_{16} = 0.144$ |
| 490 mμ: | $T_{17} = 0.145$ |

2. Transmittance, T , subscripts above are used for identification, i.e., the first digit indicates the frequency band, while the second digit the measurement number within a given band.
3. The average of the above values is:

$$T_n = \frac{(T_{11}/2) + (T_{17}/2) + T_{12} + T_{13} + T_{14} + T_{15} + T_{16}}{6}$$

c. Compute percent of deviation for each of the nine bands as shown in the following equation, and record under the indicated column of Table II:

$$\% \text{ DEVIATION} = 100 \left(1 - \frac{T_n}{T_c} \right) \quad \text{where}$$

T_n = Average Transmittance calculated by step b above

T_c = Spectral Transmittance = 0.155

d. Multiply the Percent Deviation and the Weight for each band of indicated in Table II, and record these results under the Product column of Table II.

e. Compute the average percentage deviation of spectral transmittance within the nine spectral bands of interest, as follows:

- 1) Add values of Weight column, and record the total in Table II.

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- 2) Add values of Product column, and record the total in Table II.
- 3) Divide the Weight column total into the Product column total. This value is equal to the average spectral transmittance across the nine bands.
- 4) Divide the results of step e.3 by seven (e.g., the number of measurements per band). Record this value as the average percentage of spectral transmittance per band.

6.4.3 Helmet Communications, and Sound Attenuation

6.4.3.1 Helmet Attached Microphone Tests

Illustrate performance in two parts: electrical performance in presence of aircraft environment, and ability of the microphone to form a compatible helmet "subsystem."

6.4.3.2 Helmet Mounted Headset Tests

Illustrate headset capabilities as in 6.4.3.1 above

6.4.4 Safety

A Safety Release Recommendation shall be submitted in accordance with USATECOM Regulation 385-6 based on the data collected related to safety.

6.4.5 Data Evaluation

The entire body of test data will be evaluated to determine the extent to which the helmet and its components conform and meet the requirements of the governing Army documents.

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APPENDIX A

Drop-type Impact Machine Specifications

A typical impact test set-up (see Figure A-1) has the following properties:

- A. Contains a pivoted head-form mounted on an axis 14-1/2 inches below the apex of the head.
- B. The pivoted head assembly shall be restrained at an angle of approximately 45 degrees by a suitable shear or detent device. The shear device, or equivalent, should release at 1 or 2 foot-pounds.
- C. An impact weight of 16.3 pounds with a 1.9 inch-spherical radius mounted on slide-wires such that the weight may be released and will impact the head form as shown in Figure A-1, or as otherwise specified.
- D. The head form shall contain a piezoelectric accelerometer, or equivalent, mounted directly under the intended point of impact.
- E. The head form should be of an average head size such that medium sized test items with thinnest pads installed, and large helmets with the thickest pads installed will provide a reasonable fit.
- F. The impact test system should include a suitable recording oscilloscope with a chart speed suitable for recording acceleration vs. time (accelerometer output during impact).

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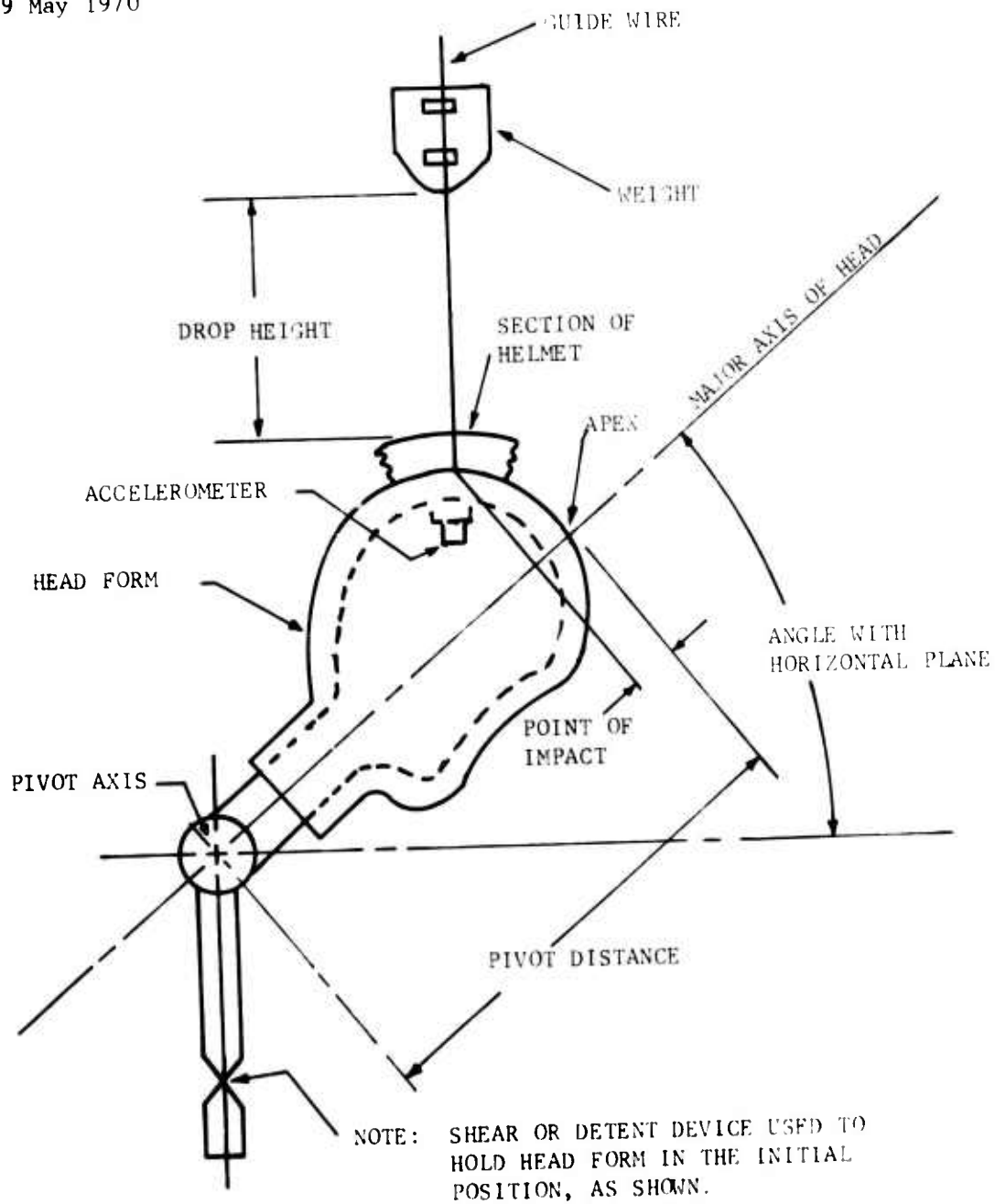


Figure A-1. Typical Impact Test Set-Up.

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UNCLASSIFIED

Security Classification

| DOCUMENT CONTROL DATA - R & D | | |
|---|--|--|
| <i>Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified</i> | | |
| 1. ORIGINATING ACTIVITY (Corporate author) US Army Test and Evaluation Command (USATECOM) Aberdeen Proving Ground, Maryland 21005 | | 2a. REPORT SECURITY CLASSIFICATION Unclassified |
| | | 2b. GROUP ----- |
| 3. REPORT TITLE US Army Test and Evaluation Command Materiel Test Procedure 7-2-085, Commodity Engineering Test Procedure, - "Helmets (Aviation)." | | |
| 4. DESCRIPTIVE NOTES (Type of report and, inclusive dates) Final | | |
| 5. AUTHOR(S) (First name, middle initial, last name) ----- | | |
| 6. REPORT DATE 19 May 1970 | 7a. TOTAL NO OF PAGES 38 | 7b. NO OF REFS 34 |
| 8a. CONTRACT OR GRANT NO DA-18-001-AMC-1045(R) | 9a. ORIGINATOR'S REPORT NUMBER(S) MTP 7-2-085 | |
| b. PROJECT NO AMCR 310-6 | 9b. OTHER REPORT NO(S) (Any other numbers that may be assigned this report) ----- | |
| c. d. | | |
| 10. DISTRIBUTION STATEMENT This document is subject to special export controls and each transmittal to foreign governments or foreign nationals, -WITH THE EXCEPTION OF AUSTRALIA, CANADA, AND UNITED KINGDOM, -may be made only with prior approval of HQ,USATECOM. | | |
| 11. SUPPLEMENTARY NOTES ----- | 12. SPONSORING MILITARY ACTIVITY Headquarters US Army Test and Evaluation Command Aberdeen Proving Ground, Maryland 21005 | |
| 13. ABSTRACT This Engineering Test Procedure describes test methods and techniques for evaluating the technical performance and characteristics of Aviation Helmets, and for determining their suitability to be subjected to test for military service use by the U. S. Army. The evaluation is related to criteria expressed in applicable Qualitative Materiel Requirements (QMR), Small Development Requirements (SDR), Technical Characteristics (TC), or other appropriate design requirements and specifications. | | |

DD FORM 1473

(PAGE 1)

SECURITY CLASSIFICATION

UNCLASSIFIED

Security Classification

1140

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UNCLASSIFIED

Security Classification

| KEY WORDS | LINK A | | LINK B | | LINK C | |
|-----------------------------|--------|----|--------|----|--------|----|
| | ROLE | WT | ROLE | WT | ROLE | WT |
| Engineering Test | | | | | | |
| Aviation Helmets | | | | | | |
| Headgear | | | | | | |
| Test Procedures | | | | | | |
| Test Methods and Techniques | | | | | | |

DD FORM 1473 (BACK)
1 NOV 63

UNCLASSIFIED

Security Classification